

MAHARANA MEWAR PUBLIC SCHOOL



Session: 2025-2026

## When Mirror Images Stop being Normal

Class:- XII - D

Subject:- Chemistry (043)

Board Roll No. :-

Submitted By:- Taha Husain

Submitted to:- Mrs. Shipra Bhojak (PGT - Chem)

# Certificate

This is to certify that **Taha Husain** of **Class XII-D** of **Maharana Mewar Public School** has completed his project (**When Mirror Images Stop being Normal**) under my supervision. I certify that this project is up to my expectations and as per the guidelines issued by the **Central Board of Secondary Education**.

Signature

Examiner

Signature

Mrs. Shipra Bhojak (PGT - Chem)

# Acknowledgement

I take this opportunity to express my profound gratitude and deep regard for my guide Mrs. Shipra Bhojak, for her amazing guidance, and wisdom.

I also want to thank my peers who helped in developing the project, and people who have willingly helped me out with their respective abilities.

# Introduction

I discovered about the concept of Chirality one day while I was scrolling YouTube and came upon a video about Chirality from a video by Steve Mould.

And I was immediately intrigued by the concept of molecules behaving differently if they were essentially just “inversed”.

And this excitement was about to be boosted to a new level when i was introduced to Chirality as a concept in our course itself.

So, I wanted to research more about this and dedicated this project for that.

So, Yeah. Let's explore the world of Chirality!

## Aim

The Aim of this Project is to study the concept of chirality in chemistry and understand its significance in chemical reactions, biological systems, and pharmaceuticals. But this will also be something where I note down and explain whatever I read about Chirality to others.

# So, What is Chirality?

Have you ever noticed that while your left and right hands are quite similar,  
But whenever you try to put one hand on another, The Thumb sticks out in  
the opposite directions?

Well, that is exactly what Chirality is!

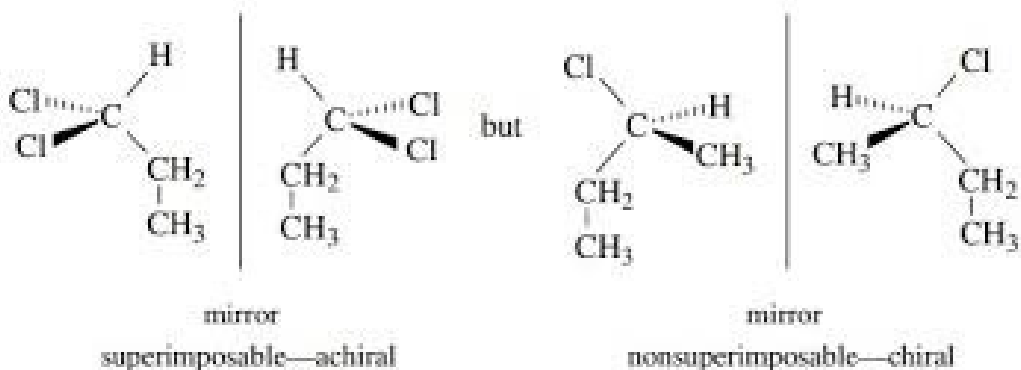
An object whose Mirror Image is not superimposable (Fancy word for  
covering the entire area of itself) on itself is called a Chiral Object.

But why am I telling you about this in a Project about Chemistry?

Well, Lo and behold, Such Non-Supreimposable Molecules also exist in  
nature!

Yep! Chiral Molecules are a thing that exists in Nature.

Here's an Image for Reference:



The Definition directly from the internet is:

“Chirality, as fundamental as symmetry itself, extends into various scientific disciplines, ranging from abstract subjects like mathematics and physics to practical disciplines like chemistry and biology. Chirality is derived from the Greek word “cheir”, which translates to “hand”. Chirality is defined as the property of an object which is not superimposable on its mirror image. This very simple property has some very profound implications, including those related to molecules, medications, as well as life itself.”

# Alright, But why is Chirality in Chemistry Significant?

Well, Let me explain:

Chiral Molecules are further broken down into 1 more term (I know boring, But still bear with me): **Enantiomers**.

The Mirror Inverted Molecules of a Chiral molecule (I know, cool name) is called it's Enantiomer or Optical Isomers.

Enantiomers share the same Physical & Chemical Properties as their "Normal" counterparts, But they do differ in their reaction with other chiral molecules and their optical activities (Bending of light!).

There is also another term for a Homogenous mixture that contains equal amounts of Normal Chiral Molecules and their Enantiomers, Those are called **'Racemic Mixtures'** (No F1 reference here btw).

Another Definition pulled straight from the Internet:

"Stereogenic Centers: The Origin of Chirality, Chirality in molecules often arises from a stereogenic centre, also known as a stereocenter. This is commonly a carbon atom bonded to four distinct groups in a tetrahedral geometry. However, atoms such as nitrogen, phosphorus, sulfur, and silicon can also serve as stereocenters if they bear four distinct substituents, including lone pairs of electrons."

More types of Chirality exist in chemistry, Namely:

- **Central Chirality**
- **Axial Chirality**
- **Planar Chirality**
- **Inherent Chirality**

# Chirality in Real Life

- Sometimes, Different types of Enantiomers produce a different stimulus for our senses, For Ex:- Something called 'L-aspartame' tastes sweet, while another thingy called 'D-aspartame' is tasteless.
- Sometimes, Chiral molecules want to hide their Chiral Nature (Just like us, They are sometimes scared to be unique and stand out).

This type of Chirality is called '**Cryptochirality**' (I know, Another cool name!)

- Many Biologically active molecules (Biomolecules referenced!) are Chiral too, Including Naturally occurring Amino Acids (Components of Proteins), Sugars and some Enzymes too
- Even some Medical Drugs have Enantiomers and some of them act quite differently than their "Normal" counterparts.

Like 'Citalopram', It is an antidepressant, And it is a Racemic Mixture because its enantiomers exist as it's a Chiral molecule.

But only one of it's Enantiomer, known as 'Escitalopram', is responsible for the Anti-Depressant effects (Btw, If you are depressed, Please approach a trusted adult ASAP. They will be able to help), While it's other enantiomer is pretty useless as a Medical Drug.

Another Medicine known as 'Penicillamine' also has Enantiomers, 'D-penicillamine' and 'L-penicillamine'.

The 'D-penicillamine' is very effective as a medication, while the 'L-penicillamine' is surprisingly toxic to the human body.

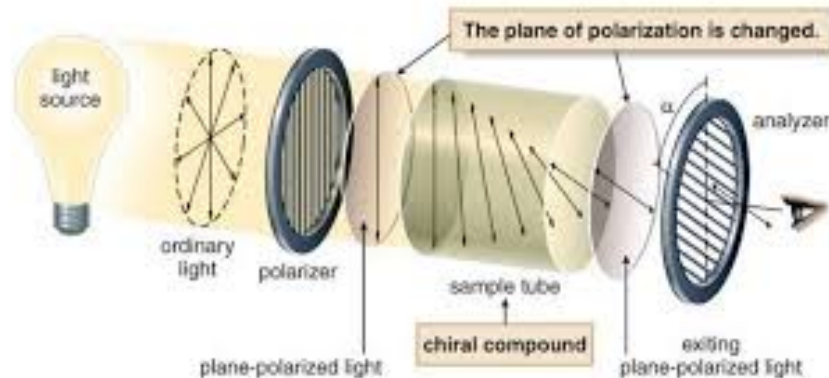
This shows the importance of recognising Chiral Molecules and their Enantiomers.

# Alright, So how do we recognise these Suckers?

Well, We have a couple of techniques up our sleeves to recognise these Suckers (I know! Humanity is just soo cool!!):

- **Their Optical Activity:** Well, As i explained above, Chiral Molecules have a notable Optical Activity (Except Cryptochiral molecules ofcourse), Chiral molecules interact with Polarised light depending on their Enantiomers.
  - If we pass a Beam of Lineraly Polarised light through 2 different mixtures of the 2 different Enantiomers of a Chiral Molecule, The (-) or 'Levorotatory (L)' form rotates the polarized light Counter-clockwise, while the (+) or Dextrorotatory (D) form rotates it Clockwise.
  - This Rotation in the plane of the Polarised light can be sensed and measured using a Polarimeter (Another cool invention!).

Here's an image for some Reference (Source - PhysicsOpenLab.org):



- **Chiral Resolution:** A cool process where we form crystals of the salts of each of the Enantiomers of a Chiral Molecule and recognise them for that.
- **Chromatography:** Liquid chromatography (HPLC and TLC) can also serve as a method for the direct separation of enantiomers.
- **Asymmetric Catalysis:** Combining metals with some Chiral ligands allows for the creation of something known as 'Asymmetric Catalysts', Which are essential in producing Enantiomerically pure compounds.



## Conclusion (At Last)

Chirality is yet another amazing phenomenon that occurs in our Beautiful world.

A lot of other concepts like Chirality exist undiscovered, Begging for us to find and understand them.

This was it for my Report on Chirality and what it truly entails!

I can't wait to research deeper about it and other similar concepts.

Reseraching about Chirality has time and time again reminded me of a quote from Sir Stephen William Hawking:

“Look up at the stars and not down at your feet. There is still plenty more out there to find out”

And with that, I take my leave. Thanks a lot for listening to my nonsense, excited rambling about a topic I found interesting.

I hope you found the concept of Chirality exciting too and were able to easily follow along with my report.

ThankYou so much for your time!

**This is Taha, Signing off! :3**

## **Bibliography and Credits**

**Information sourced from:** Wikipedia (The Wikimedia Foundation),  
Articles found by Google, Reddit, YouTube (Shout out to Steve Mould!),  
arXiv, The Internet Archive

**Information compiled by:** Yours truly, Taha Husain!